

## C-A OPERATIONS PROCEDURE MANUAL

### C-A TPL 03-04 TEMPORARY PROCEDURE TO MONITOR THE RHIC ASE

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#### Hand Processed Changes

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## C-A TPL 03-04 TEMPORARY PROCEDURE TO MONITOR THE RHIC ASE

### 1. Purpose

- 1.1 The purpose of this procedure is to provide instructions to MCR staff to limit particle losses during RHIC operations in order to comply with the Beam Intensity Operational Safety Limits (OSL) found in [C-A OPM 2.5.2 RHIC Accelerator Safety Envelope Parameters](#).
- 1.2 This procedure authorizes MCR staff to use the Beam Loss Account Manager (BLAM) to monitor RHIC OSLs. BLAM alone operation was approved last year.
- 1.3 This procedure authorizes the MCR staff to cycle the RHIC beam stops (G1BS & G2BS) whenever it is thought that entire energy of the beam is intercepted by the beam stops.

### 2. Responsibilities

- 2.1 The Operations Coordinator is responsible for the execution of this procedure.
- 2.2 The RHIC Commissioners are responsible for responding to requests from the Operations Coordinator to terminate beam delivery when asked to do so.
- 2.3 MCR Operators are responsible for monitoring the Alarm Display Task (ADT).
- 2.4 The cognizant software developer is responsible for controlling the configuration of the BLAM application.

### 3. Prerequisites

- 3.1 The uxf1 and uxf3 beam current transformers must be operational.  
The transformers w (wxfl), x (xxfl), and y (yxfl) cannot be declared operational without first threading ions through them.
- 3.2 The RHIC loss monitors and circulating beam current transformers must be working for BLAM as well as the PostMortem, and LossAnalysis servers.
- 3.3 The "RHIC Alarm Page" must be operational.
- 3.4 The GPMs BeamLossAccountBlue.mon and BeamLossAccountYellow.mon must be displaying the RHIC BLAM inputs for a period of one hour or greater.
- 3.5 The target group for this procedure is the RHIC Commissioning Group Leaders, MCR Operators and Operations Coordinators (OC), and the MCR Group Leader.
- 3.6 The training requirement for this procedure is read and sign.
- 3.7 The minimum number of staff members that need to be trained in order for this procedure to be effective is three, one RHIC Commissioning team leader, one OC and one operator.

### 4. Precautions

- 4.1 None

### 5. Procedure

- 5.1 Required software tools
  - 5.1.1 Verify the BLAM server is running .
    - 5.1.1.1 BLAM may be found at  
StartUp/Servers/RHICManagers/BeamLossAccountingManager

5.1.2 Changes to the BLAM software are not be permitted without the approval of the cognizant physicist or his designate.

5.1.2.1 The date and time changes are made to the BLAM source code shall be documented using the same standard procedures and practices used by the Controls group for all of their applications.

5.1.2.2 BLAM parameters are available via pet. To control the parameter configuration, the file is stored in a non-public location.

## 5.2 Required Instrumentation

5.2.1 The appropriate transformer must be operational for the planned evolution.

5.2.1.1 uxf1 and uxf3 must be operational. The operation of wxf1 can be determined as ions are threaded through it.

5.2.1.2 wxf1 must be operational to thread ions through the x and y arcs. The operation of xxf1 and yxf1 can be determined once beam has been threaded through them.

5.2.2 For BLAM operation, the circulating beam transformers and 80% of the loss monitors must be operational in each RHIC ring

## 5.3 BLAM Alarms designed to ensure compliance for losses in a RHIC CONTROLLED area.

### Note 1:

BLAM is a sophisticated application that takes credit for particles cleanly dumped in the beam dumps. Particles that are registered in loss monitors at locations other than the beam dumps will contribute to the hourly loss. BLAM gives increasing weight to particles lost at high energy.

5.3.1F you observe on the RHIC ADT

a LEVEL 3 **blue(yellow):50% of allowed hourly loss (WARNING)** alarm, THEN 50% of the allowable limit of Au ions (or deuterons or protons) are assumed to have been lost at a point in RHIC or in the X or Y arc.

5.3.1.1 The alarm serves as a warning and the alarm will not clear from the screen until sufficient time passes during low loss operation such that the hourly average goes below the threshold.

5.3.2 IF you observe on the RHIC ADT

a LEVEL 4 **blue(yellow):90% of allowed hourly loss (ERROR)** alarm, THEN 90% of the allowable limit of Au ions (or deuterons, or protons), are assumed to have been lost at a point in RHIC (paragraph 5.3.2.1) or in the X or Y arc (paragraph 5.3.2.2).

5.3.2.1 The OC shall prohibit injection of ions into the RHIC until the LEVEL 4 alarm clears from the ADT screen AND sufficient time passes such that  $3.6 \times 10^{11}$  Au ions ( $3.3 \times 10^{13}$  protons,  $2.93 \times 10^{13}$  deuterons) at injection, cannot be lost in the RHIC in one hour, OR

5.3.2.2 The OC shall prohibit injection of ions into the RHIC until the LEVEL 4 alarm clears from the ADT screen AND sufficient time passes such that  $2.8 \times 10^{11}$  Au ions ( $2.6 \times 10^{13}$  protons,  $2.3 \times 10^{13}$  deuterons) at injection, cannot be lost in the arc(s) in one hour.

#### 5.4 Monitoring Railroad Avenue.

5.4.1 IF you observe on the AGS Alarm Display a Level 4 NM401 sisScaler.5a-ps2.1 RANGE ERROR alarm, THEN the chipmunk on Railroad Avenue is alarming at 80% of the allowable dose rate permitted in an uncontrolled area.

##### 5.4.1.1 After ONE such event

- investigate the source of the problem.
  - Operate with only six bunches per ring if necessary during diagnostics
  - Review the PostMortem loss monitor data and contact the LossMonitor Systems Cognizant Physicist for assistance
  - Review orbit data and contact the cognizant accelerator physicist for assistance.
- Contact the Liaison Physicist for assistance and the Radiation Protection Physicist to inform him of the situation.
- Do not resume normal operation until the source of the problem is found and the problem fixed, OR if given explicit permission by the RSC Chairperson and the C-AD Associate Chairperson for Safety, to resume “normal operation”

#### 5.5 Calculating Beam Dump Totals using Current Transformers:

##### Note 2:

For unknown reasons, a pulse measuring  $\sim 10E40$  may be added to the integrated total which operations uses to regulate the amount of beam dumped and stay under OSLs outlined in this procedure. A pulse of this magnitude is physically impossible.

For BLAM, one must take the last good data point (blueLossHourSumM or yellowLossHourSumM) and add that to subsequent points following a stop and start of the BLAM manager. This shall continue until an hour has passed.

By observing a plot of the current transformers for the last hour, one must calculate dumped beam totals and therefore stay within limits by adding previous totals to new totals (after reset following bad data).

##### Note 3:

Incorrect data is defined as a pulse that reads greater than  $1E10$  on the AtR current transformers. Or increases on the RHIC DCCT of more than a factor of two after RHIC injection is complete.

##### 5.5.1 IF an incorrect data point is observed THEN:

- 5.5.1.1 Calculate the last hour's beam by integrating points using the AtrXStrip.mon plot.
- 5.5.1.2 Use these as representative hourly totals and follow this procedure.
- 5.5.1.3 Stop and start CLYDE, which will reset the totals.

- 5.5.1.4 After 10 minutes, recalculate the old total for 50 minutes and add this to the newly integrated totals.
  - 5.5.1.5 Use these as representative hourly totals and follow this procedure
  - 5.5.1.6 Repeat 5.5.1.4 and 5.5.1.5 above, subtracting 10 minutes from the old total each time until an hour has passed.
  - 5.5.1.7 After an hour has passed, respond to dumped beam totals as displayed by CLYDE.
- 5.6 IF the RHIC beam stops, G1BS and/or G2BS, are thought to have intercepted all or part of the circulating beam THEN
- 5.6.1 Open and close the beam stops several times using the pushbutton on the RHIC PanelView at MCR\_2 to determine whether the energy loss of the beam has caused the beam stop to deform.
    - 5.6.1.1 IF the beam stop readbacks indicate that they both can be opened and closed repeatedly then they have not been deformed.
    - 5.6.1.2 IF the beam stop readbacks indicate that one or both beam stops cannot be opened and closed repeatedly, THEN cease operations and contact, the Access Controls Group Group Leader, the Radiation Safety Committee Chairperson, and the Chief Mechanical Engineer.

5.7 —RHIC beam current transformer alarms.

5.7.1 IF you get a yi2-xf3.dvmctrl:dcctBeamM range error alarm or a bi2-xf3.dvmctrl:dcctBeamM range error alarm on the RHIC ADT then you are in violation of the ion number limit of the RHIC OSL in OPM 2.5.2. Abort the beam in the ring that is generating the alarm and refill with fewer deuterons/gold ions.

6. Documentation

- 6.1 Operations Coordinator's shift log.

7. References:

- 7.1 [C-A OPM 2.5.2 "RHIC Operational Safety Limits /Accelerator Safety Envelope"](#)

8. Attachments:

- 8.1 None